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(54) Title: TEXTURE AND STABILIZER COMPOSITION

(57) Abstract

A stabilizing and texturizing agent comprised of microcrystalline cellulose and a bulking agent, and optionally a hydrocolloid. A foodstuff containing the stabilizing and texturizing agent and a process for making the stabilizing and texturizing agent.

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TEXTURE AND STABILIZER COMPOSITION

This invention relates to the preparation and composition of a powder capable of functioning as a stabilizing agent in a wide variety of products such as foods and cosmetics.

Background of the Invention

In the preparation of a stabilizing agent and texture agent, microcrystalline cellulose may be an important component. However, when microcrystalline cellulose is prepared for use as a stabilizing agent and/or texture agent in a food or cosmetic, it must be coprocessed, such as by drying with another material which will prevent the microcrystalline cellulose from aggregating (hornifying) upon drying so that it can be dispersed in a liquid.

It has become common practice to spray-dry the microcrystalline cellulose with a material such as carboxymethyl cellulose so that the carboxymethyl cellulose will protect the microcrystalline cellulose such as by coating it or in some other way such as the prevention of hydrogen bonding between the microcrystalline cellulose particles so as to eliminate the formation of undesirable aggregates.

A material such as carboxymethyl cellulose does an excellent job in protecting the microcrystalline cellulose particles. However, when carboxymethyl cellulose is coprocessed with microcrystalline cellulose such as by spray-drying, the composition to be spray-dried will have a low solids content of up to about 6 or 10% solids. What this means is that large volumes of a dispersion must be spray-dried to obtain a given amount of a microcrystalline cellulose/carboxymethyl cellulose composition. The resulting spray-dried composition may then be redispersed in a liquid.

US Patent 3,539,365 describes a composition which is a dispersing and stabilizing agent. This composition comprises a major portion of a microcrystalline cellulose dispersed in an aqueous medium in the presence of a water-soluble carboxymethyl cellulose and recovering a dry powder such as by spray-drying. The slurry which is spray-dried contains from 3% to 10% solids.

The '365 patent fails to teach spray-drying a slurry which has more than 10% solids or the use of a material in place of carboxymethyl cellulose or a method for preparing a stabilizing composition comprised of microcrystalline cellulose and a

material to prevent the microcrystalline cellulose from agglomerating, other than carboxymethyl cellulose.

United States Statutory Invention Registration H1229, published September 7, 1993 teaches spray-drying microcrystalline cellulose and carboxymethyl cellulose and maltodextrin. The H1229 publication states that spray-drying may be carried out at a solids level of from 10-25%. However, carboxymethyl cellulose was still present. The H1229 publication fails to teach or suggest coprocessing a composition which does not contain carboxymethyl cellulose and adding carboxymethyl cellulose to a coprocessed microcrystalline cellulose/maltodextrin (bulking agent) composition at a later stage which does not involve further spray-drying.

US Patent 4,263,334 teaches replacing carboxymethyl cellulose in a microcrystalline cellulose/carboxymethyl cellulose composition by substituting a combination of additives for the carboxymethyl cellulose. The additives consist of a carbohydrate sweetener and a hydrocolloid gum. The carbohydrate sweetener may be any one of a number of materials such as hydrolyzed cereal solids or maltodextrin. The hydrocolloid gum may be, for example, xanthan. However, carboxymethyl cellulose is not a part of the composition and the '334 patent teaches that the inclusion of carboxymethyl cellulose is to be avoided.

US Patent 4,704,294 is directed to a dry mix composition suitable for addition to a boiling or hot liquid which contains a starch thickening agent, a carbohydrate binding agent having a dextrose equivalent of less than 20 and effective for preparing an agglomerated product, a buffering agent and a binding agent which may be maltodextrin. The '294 patent also teaches that carboxymethyl cellulose may be present in an amount of from about 3-5% as part of the starch thickening agent. The '294 patent fails to teach or suggest applicants' composition or a process for preparing a carboxymethyl cellulose containing microcrystalline cellulose/bulking agent (e.g. maltodextrin) which may utilize carboxymethyl cellulose at a late stage in the preparation of the dispersing or stabilizing agent.

US Patent 4,415,599 is directed to a dry mix for the preparation of gravies and sauces. The composition comprises a thickening agent such as starch and/or flour and maltodextrin. The procedure does not involve coprocessing or spray-drying. Further, the '599 patent fails to teach or suggest applicants' composition or process.

US Patent 4,980,193 is directed to a stabilizing agent for solids in an aqueous medium. The stabilizing agent comprises a coprocessed microcrystalline cellulose, starch and a non-thickening water-soluble diluent for the microcrystalline cellulose. The starch containing composition may also contain maltodextrin and

carboxymethyl cellulose associated with the microcrystalline cellulose. The '193 patent fails to teach or suggest applicants' composition or process for preparing a coprocessed microcrystalline cellulose/bulking agent (e.g. maltodextrin).

Summary of the Invention

Broadly, this invention contemplates a powdered coprocessed stabilizing agent comprising, by weight, from about 40% to about 60% of a coprocessed bulking agent, the balance comprising microcrystalline cellulose.

This invention also contemplates a powdered stabilizing agent comprising a coprocessed composition of from about 3% to about 10% of carboxymethyl cellulose, about 5% to about 28% of maltodextrin, the balance being microcrystalline cellulose.

This invention further contemplates a food composition comprising a foodstuff having incorporated therein a powdered coprocessed stabilizing agent comprising, by weight, from about 40% to about 60% of a bulking agent, the balance comprising microcrystalline cellulose.

Further, this invention contemplates a process for producing a powdered texture and/or stabilizing agent comprising shearing a microcrystalline cellulose wetcake, blending the sheared wetcake with a bulking agent in an amount of from about 40% to about 60% bulking agent and from about 60% to about 40% of microcrystalline cellulose, mixing the resultant blend containing up to about 30% solids and drying the blended mixture to form a flowing powder.

This invention further contemplates a process wherein after the flowing powder has been prepared by coprocessing the bulking agent and microcrystalline cellulose, a flowing hydrocolloid powder is added to the coprocessed flowing powder and blended therewith.

Detailed Description

All percentages set forth in the specification and claims are percentages by weight unless otherwise indicated.

One of the compositions of this invention may be prepared by shearing a microcrystalline cellulose wetcake and then blending the sheared wetcake with a bulking agent, such as maltodextrin. The resultant blend is then codried to form a flowing powder. The composition described above is particularly advantageous because the blended mixture may be coprocessed, particularly spray-dried, at a solids content of up to about 30% whereas, if carboxymethyl cellulose were to be substituted for the bulking agent, then the through-put would be much less, and the

composition to be spray-dried would be in the order of a slurry containing up to about 10% solids.

When a flowing powder containing carboxymethyl cellulose or other hydrocolloid is desired, then it may be prepared in the manner described above but containing carboxymethyl cellulose and the like in an amount of about 3% to about 10%, from about 5% to about 28% of a bulking agent such as maltodextrin, the balance being microcrystalline cellulose. The coprocessed composition is prepared in the same manner as described above, that is, shearing the microcrystalline cellulose wetcake, blending the sheared wetcake with the maltodextrin and carboxymethyl cellulose mixing the resultant blend and coprocessing the blended mixture to form a flowing, stable, uniform powder.

In yet another embodiment of this invention, a flowing bulking agent/microcrystalline cellulose composition may be prepared by coprocessing the bulking agent with the microcrystalline cellulose as described above. Thereafter, carboxymethyl cellulose or other hydrocolloid which is a flowing powder, may be added to the microcrystalline cellulose/bulking agent flowing powder. The advantage of this composition is that the microcrystalline cellulose/bulking agent composition will have been prepared using a greater through-put. The hydrocolloid such as carboxymethyl cellulose, is prepared in any suitable manner to yield a flowing powder and is then added to the coprocessed microcrystalline cellulose/bulking agent. This may be done by blending the powders or by first dispersing the microcrystalline cellulose/bulking agent into a liquid and then blending and dispersing the carboxymethyl cellulose or other hydrocolloid into the same liquid. If the microcrystalline cellulose/bulking agent composition is used by itself, there is no substantial increase in the viscosity of a liquid to which it is added. However, when it is desired to prepare a gravy or soup, for example, it usually is desired to increase the viscosity of the gravy or soup beyond that of a water-like consistency. When this is desired, then the coprocessed microcrystalline cellulose/bulking agent composition will have a hydrocolloid such as carboxymethyl cellulose added to it to increase the viscosity of the liquid.

The advantage of including the bulking agent, such as maltodextrin, in the composition is that although a microcrystalline cellulose/maltodextrin composition, when dispersed in a liquid will not substantially increase the viscosity of the liquid. When a hydrocolloid, such as carboxymethyl cellulose is added, the viscosity of the liquid in which the composition is dispersed will be increased and the composition will be stabilized.

What is unexpected is that when the percentage of hydrocolloid, such as carboxymethyl cellulose in the composition is kept at a constant percentage by weight, the viscosity of a liquid containing the three component composition will be increased by increasing the percentage of microcrystalline cellulose or bulking agent which is present. The microcrystalline cellulose and bulking agent will, in and of itself not have a substantial effect upon the viscosity.

The bulking agent which is used will function to prevent hornification of the microcrystalline cellulose particles during processing, either by spray-drying or other means of coprocessing or when being redispersed in a liquid.

The term bulking agent, as used in the specification and claims, is meant to exclude carboxymethyl cellulose as the bulking agent but to include a carbohydrate material such as sucrose, dextrose, hydrolyzed cereal solids, fructose, lactose, maltose, invert sugar, corn syrup solids, dextrins, maltodextrin, galactose, and the like. Any bulking agent may be used which may be coprocessed with microcrystalline cellulose to form a flowing powder.

The amount of bulking agent may vary widely and the range of bulking agent used will be dependent on whether a hydrocolloid, such as carboxymethyl cellulose, is to be coprocessed with the bulking agent and microcrystalline cellulose.

If the coprocessing of the composition is to include only microcrystalline cellulose and the bulking agent, then the bulking agent may be present in an amount of from about 40% to about 60% of bulking agent and 60% to about 40% of microcrystalline cellulose. If the composition to be coprocessed includes a hydrocolloid, such as carboxymethyl cellulose, then the amount of bulking agent present will vary from about 5% to about 28%, from about 3% to about 10% of hydrocolloid, the balance being microcrystalline cellulose.

When the coprocessed composition comprises two components only (the bulking agent and microcrystalline cellulose) then, if the bulking agent is present in an amount of less than about 40%, the resultant coprocessed composition will not be satisfactory because the bulking agent will not be present in an amount sufficient to operate as a barrier dispersant and prevent agglomeration of the microcrystalline cellulose particles. If more than about 60% of the bulking agent is present in the coprocessed composition, then the amount of microcrystalline cellulose present will be insufficient to obtain the proper colloidal content in a liquid.

The proper colloidal content referred to will vary widely from about 10% to about 70% when the resultant dispersion is to be coprocessed. The proper colloidal

content of the composition, whether a two component or three component composition, will vary depending upon the use for which it is intended.

It is important that the colloidal content of the microcrystalline cellulose be preserved. This preservation is obtained by processing the microcrystalline cellulose with a bulking agent such as maltodextrin which will prevent hornification of the microcrystalline cellulose particles.

When a hydrocolloid, such as carboxymethyl cellulose, is later added to the microcrystalline cellulose/bulking agent composition and dry blended therewith, upon the dry blend being dispersed in a liquid, the hydrocolloid combined with the microcrystalline cellulose will form a network which provides the desired viscosity and the desired rheology which affects the textural properties of a product to which it is added.

The hydrocolloid will not form the network unless hornification has been prevented. The bulking agent will have accomplished that task.

When a three component system containing microcrystalline cellulose, a bulking agent and a hydrocolloid is to be prepared, then the amount of bulking agent may vary from about 5% to about 28% and preferably from about 9% to about 17%. If less than about 5% of bulking agent is present, then the ratio of microcrystalline cellulose to hydrocolloid will be too high and will be deleterious for the maintenance of stabilization in the final product. If the amount of bulking agent exceeds 28%, in a system which contains bulking agent, hydrocolloid and microcrystalline cellulose, then the stabilizing functionality of the resultant product will be adversely affected.

In a preferred embodiment of the two component coprocessed composition, it has been found that when the bulking agent is present in an amount of from about 45% to about 55%, excellent results are obtained. In a still more preferred embodiment when the bulking agent is present in an amount of about 50%, superior results are obtained.

When the coprocessed system contains a hydrocolloid, then the ratio of the bulking agent to the microcrystalline cellulose should be about 0.4:1 or less. If the ratio is greater than 0.4:1, than product functionality (viscosity/stability) may be reduced.

In a particularly preferred embodiment, whether a two component or three component coprocessed system is to be prepared, maltodextrin is the preferred bulking agent because excellent results have been obtained thereby.

The bulking agent which is used should have a dextrose equivalent (DE) of from about 4 to about 20. Generally, the higher the dextrose equivalent, the higher

the solubility of the bulking agent in water. However, if the dextrose equivalent exceeds 20, then the resultant coprocessed product might be too sticky to be of commercial use. If the dextrose equivalent is below about 4, the solubility of a liquid dispersion will be adversely affected so that, the dispersion might be too viscous to process.

The hydrocolloid which is used may be used in two ways. It may be made part of the microcrystalline cellulose/bulking agent composition to form a three component composition or it may be added, as a flowing powder, to the coprocessed flowing microcrystalline cellulose/bulking agent composition.

The hydrocolloid, such as carboxymethyl cellulose may be added as a flowing stable powder to the coprocessed two component system. When added to the composition in this manner, it may be added in an amount of from about 1% to about 80%, preferably about 4% to about 10%. The amount of hydrocolloid added will vary depending upon the end use for the three component system and the viscosity desired. When the hydrocolloid is added as a flowing stable powder to the coprocessed two component system, its function is to provide stability to the microcrystalline cellulose dispersion and increase the viscosity of a liquid to which it is added, such as a salad dressing or a yogurt product.

Among the hydrocolloids which may be used are guar gum, locust bean gum, gum arabic, sodium alginate, propylene glycol alginate, carrageenan, gum karaya, xanthan, carboxymethyl cellulose, pectin, konjac, agar and the like. It is preferred however to use carboxymethyl cellulose because excellent results have thereby been obtained.

The microcrystalline cellulose may be obtained from a raw material such as wood, wood pulps such as bleached sulfate and sulfate pulps, cotton, flax, hemp, bast or leaf fibers, regenerated forms of cellulose, soy hulls, corn hulls, nut hulls, and the like.

Microcrystalline cellulose is generally prepared from the raw material sources by a combination of a chemical degradation and mechanical attrition. Chemical degradation may be accomplished by any of several well known methods. For example, the source material is rendered into a cellulose rich pulp and the pulp is then hydrolyzed with dilute mineral acid. Next, the wet cellulose-containing filter cake is sheared to reduce the average particle size of from about 0.1 to about 10 microns. Shearing of the hydrolyzed cellulose particles to form colloidal particles may be accomplished using any suitable apparatus such as a Silverson® mixer. The

choice of mixer will be apparent to one skilled in the art taking into consideration the particle size desired.

The amount of microcrystalline cellulose which may be present may vary widely but is preferably from about 62% to about 86%.

The bulking agent, such as maltodextrin and the hydrocolloid such as carboxymethyl cellulose if present, is added to the wetcake and is blended therewith. The maltodextrin or carboxymethyl cellulose is added so that the composition to be coprocessed will contain the necessary solids content. That solids content, if a two component system containing microcrystalline cellulose and a bulking agent, will be up to about 30%. If the system to be coprocessed is a three component system, then the solids content of the system will be from about 3 to about 10% and preferably about 5%.

The composition according to this invention may be prepared by shearing a microcrystalline cellulose wetcake in a mixer, such as a Silverson® mixer, blending the wetcake with the bulking agent and, if present, the hydrocolloid. The blend is then mixed to produce a uniform dispersion.

If the blend is to be spray-dried, then a liquid, such as water, is added to the blend to produce a dispersion having the desired solids content, which will vary depending on whether a hydrocolloid is present or not. The dispersion will then be spray-dried at an inlet temperature of from about 200°C to about 280°C and an outlet temperature of from about 100°C to about 120°C.

If the mixture is to be bulk-dried such as in a fluid bed dryer, then it is not necessary to dilute the dispersion for the purpose of further processing it and instead, the dispersion will be diluted, if diluted at all, solely for the purpose of the economics involved and the desired solids content.

The compositions of this invention may be added to a food or cosmetic product in an amount of from about 0.1% to about 20%. The amount of the composition added to the food or cosmetic product will depend on the food product to which it is added. Whether the two component (microcrystalline cellulose/bulking agent) system is used or whether the three component system which contains a hydrocolloid is used will depend upon the product to which they will be added. For example, if one is adding the stabilizer composition to dry powdered chocolate drink, one would use the two component system (microcrystalline cellulose and bulking agent) and add carboxymethyl cellulose to stabilize the composition so that the solids would not settle out when a liquid, such as milk, is added to the composition to make the chocolate drink.

In contrast with this, if it is desired to prepare a salad dressing, then the three component system, which contains a coprocessed hydrocolloid, may be used to increase the viscosity of the composition and to obtain, when added to a salad dressing, proper mouthfeel and texture modification.

As stated earlier, the hydrocolloid used need not have been coprocessed with the bulking agent and microcrystalline cellulose. Instead, the microcrystalline cellulose and bulking agent may have been coprocessed together and subsequently, the flowing powder hydrocolloid may then be added to the two component system and the resultant three component system may then be used in food compositions. The two or three component composition of this invention may also be used for other products such as sour cream, yogurt, yogurt drinks, stabilized frozen yogurt, whipping creams, puddings, and in peanut butter and low moisture food systems and as an excipient for chewable tablets in pharmaceutical applications as well as for cosmetic applications, for example, in cold cream formulations and tooth paste.

In order to more fully illustrate the nature of this invention and the manner of practicing the same, the following examples are presented. In the examples the abbreviation "MCC" has been used to indicate microcrystalline cellulose. The abbreviation "DE" indicates dextrose equivalent.

Example 1

Coprocessed Microcrystalline Cellulose and Maltodextrin (10 DE) at 50/50

This example details the coprocessing of hydrolyzed cellulose wetcake with maltodextrin (DE 10) in which the maltodextrin serves as a barrier dispersant to preserve the colloidal properties of the sheared hydrolyzed cellulose when the combination of materials is spray dried.

In a colloid mill is placed 7115.76 grams of deionized water. To the water is added 1164 grams of maltodextrin (10 DE, 93.9% solids). The colloid mill rheostat is set at 62.5 and an auxiliary Lightnin' mixer is operated at a rheostat setting of 75 for a period of five minutes. Upon completion of mixing, 3720.24 grams of sheared, hydrolyzed cellulose wetcake is added to the colloid mill which is operated at the same settings for an additional 10 minutes. The viscosity of this mixture containing 25% solids is measured by a Brookfield RVT viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes. The viscosity is 85,000 cps. The mixture is then passed through a homogenizer operated at 17,236.9 kPa (2500 psi). After homogenization, the viscosity is 96,600 cps. The homogenized mixture is then

spray dried at an inlet temperature of 195°C and an average outlet temperature of 115°C, yielding a powder as the product.

The same sheared, hydrolyzed cellulose wetcake is coprocessed with maltodextrin (DE 10) at the following ratios of MCC to maltodextrin: 80/20, 60/40, and 40/60.

Example 2

Coprocessed Microcrystalline Cellulose and Maltodextrin (15 DE) at 50/50

This example details the coprocessing of hydrolyzed cellulose wetcake with maltodextrin (DE 15) in which the maltodextrin serves as a barrier dispersant to preserve the colloidal properties of the sheared hydrolyzed cellulose when the combination of materials is spray dried.

The procedure of Example 1 is followed in which 655.82 grams of maltodextrin (15 DE, 95.9% solids) and 1488.1 grams of sheared, hydrolyzed cellulose wetcake are combined in 2856.08 grams of deionized water. After homogenization the viscosity is 80,200 cps. Spray drying yields 514 grams of coprocessed powder having a water content of 2.5% by weight.

The same sheared, hydrolyzed cellulose wetcake is coprocessed with maltodextrin (DE 15) at the following ratios of MCC to maltodextrin: 80/20, 60/40, and 40/60. The dispersion profiles of three of these coprocessed powders is determined by dispersing each at three concentrations, 8%, 10%, and 12%, in deionized water using a Waring blender for 3 minutes at 90 Volts. The viscosity of each is measured using a Brookfield RVT viscometer fitted with Spindle #3 operated at 20 rpm for 30 seconds. The results of these viscosity measurements are shown in Table 1.

Table 1

Concentration	8%	10%	12%
MCC/maltodextrin (DE 15)	Viscosity (cps)		
50/50	368	550	1,050
60/40	210[a]	300	650
80/20	75[a]	125	250

[a] Two-phase separation of dispersion.

The phase separation observed for the dispersions of the 60/40 and 80/20 ratio materials at 8% solids demonstrates that there is insufficient material present to stabilize the dispersion.

Example 3

Effect on Viscosity of Dry-blending MCC/Maltodextrin (50/50) with Carboxymethylcellulose

This example shows that spray-dried, coprocessed sheared hydrolyzed cellulose and maltodextrin may be dry blended with carboxymethylcellulose to provide a synergistic effect on the viscosity of an aqueous dispersion of the dry blend. This is in contrast with dispersions of either the coprocessed hydrolyzed cellulose/maltodextrin or the carboxymethylcellulose alone in which the viscosity is too low to measure. It also shows that the preferred ratio of hydrolyzed cellulose to maltodextrin is 60/40 to 40/60.

A dry blend of 94.42 parts of MCC/maltodextrin (DE 10) (50/50), prepared in Example 1, and 5.58 parts of carboxymethylcellulose is prepared. To prepare a dispersion in which there is 2.33% by weight of total solids, 7.56 grams of the dry blend and an additional 1.76 grams of maltodextrin (DE 10) are dispersed in 390.68 grams of distilled water in a Waring blender operated at a rheostat setting of 90 for 3 minutes followed by 10 minutes at a rheostat setting of 60. The initial viscosity of this dispersion is measured using a Brookfield RVT viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes. The initial viscosity of this dispersion is 1,000 cps. Twenty-four hours after making the dispersion, its set-up viscosity is measured in an identical manner. The set-up viscosity of this dispersion is 4,600 cps. Other dispersions of this dry blend containing 4.66%, 6.99%, and 9.32 % by weight solids are prepared in an identical manner. A proportionate amount of maltodextrin (DE 10) is added to the calculated amount of dry blend of coprocessed MCC/maltodextrin (DE 10) and carboxymethylcellulose to provide the desired weight percent of solids in each dispersion. Similar dry blends of 80/20, 60/40, and 40/60 ratios of coprocessed MCC/maltodextrin (DE 10) and carboxymethylcellulose are prepared. In preparing dispersions of these dry blends, appropriate amounts of additional maltodextrin are added to make a dispersion containing the desired weight percent of dry solids. The exception is the 40/60 coprocessed MCC/maltodextrin (DE 10) in which no additional maltodextrin (DE 10) is required. The initial

viscosities of these dispersions are shown in Table 2, and the set-up viscosities for the same dispersions as measured after 24 hours are shown in Table 3.

Table 2
Initial Viscosities of MCC/maltodextrin (DE 10) Coprocessed at Different Ratios

	MCC/Maltodextrin		80/20	60/40	50/50	40/60
Solids (5)	MCC (%)	CMC (%)		Viscosity (cps)		
2.33	0.88	0.13	0	500	1,000	1,000
4.66	1.76	0.26	1,000	23,600	28,000	32,800
6.99	2.64	0.39	4,000	63,400	64,800	67,000
9.32	3.52	0.52	8,000	102,000	105,200	106,000

Table 3
Set-up Viscosities of MCC/maltodextrin (DE 10) Coprocessed at Different Ratios

	MCC/Maltodextrin		80/20	60/40	50/50	40/60
Solids (5)	MCC (%)	CMC (%)		Viscosity (cps)		
2.33	0.88	0.13	500	3,500	4,600	5,400
4.66	1.76	0.26	3,000	37,000	41,400	43,200
6.99	2.64	0.39	9,000	92,800	97,600	98,600
9.32	3.52	0.52	38,000	140,000	144,200	142,000

Also, a dry blend of the coprocessed MCC/maltodextrin (DE 15) (50/50), prepared in Example 2, is prepared using 94.42 parts of the coprocessed powder and 5.58 parts of carboxymethylcellulose. Dispersions containing 2.33%, 4.66%, 6.99%, and 9.32% by weight solids are prepared according to the procedure described above, and their viscosities are measured in an identical manner. Dispersions of dry blends of coprocessed MCC/maltodextrin (DE 15) in ratios of 80/20, 60/40, and 40/60 and carboxymethylcellulose are also prepared using the procedure described above. The initial and set-up viscosities of all of these dispersions are measured as described above. The initial viscosities of these dispersions are shown in Table 4, and their set-up viscosities are shown in Table 5.

Table 4

Initial Viscosities of MCC/maltodextrin (DE 15) Coprocessed at Different Ratios

	MCC/Maltodextrin		80/20	60/40	50/50	40/60
Solids (5)	MCC (%)	CMC (%)		Viscosity (cps)		
2.33	0.88	0.13	0	500	1,000	1,000
4.66	1.76	0.26	1,500	24,000	35,000	34,000
6.99	2.64	0.39	6,000	66,800	68,200	69,400
9.32	3.52	0.52	10,000	104,000	111,200	118,000

Table 5

Set-up Viscosities of MCC/maltodextrin (DE 15) Coprocessed at Different Ratios

	MCC/Maltodextrin		80/20	60/40	50/50	40/60
Solids (5)	MCC (%)	CMC (%)		Viscosity (cps)		
2.33	0.88	0.13	500	4,200	5,200	5,400
4.66	1.76	0.26	3,500	38,400	43,800	44,000
6.99	2.64	0.39	10,000	92,000	98,000	99,400
9.32	3.52	0.52	38,400	141,000	145,400	146,000

Example 4

Coprocessed MCC, Maltodextrin (DE 15), and Carboxymethylcellulose in a Ratio of 89/3/8

This example details the preparation of a three component coprocessed dry powder comprised of hydrolyzed cellulose wetcake, maltodextrin, and carboxymethylcellulose in a ratio of 89/3/8. The colloidal content of this product is 49.08%.

In a Hobart mixer bowl are placed 1633.03 grams of hydrolyzed cellulose wetcake, 25.61 grams of maltodextrin (De 15) (93.7% solids) and 67.94 grams of carboxymethylcellulose (94.2% solids). This composition is mixed for 15 minutes after which it is passed through a shear mixer having a very restricted outlet gate. A portion of this sheared material is then dispersed in deionized water to prepare 3000 grams of dispersion containing 5 weight percent solids. The dispersion is prepared in a Waring blender operated at medium speed for 5 minutes. Mixing is interrupted after 2 minutes to scrape down the sides of the blender. The viscosity of this

dispersion as measured by a Brookfield RVT viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes is 80,000 cps. The dispersion is then passed through a homogenizer operated at 17,236.9 kPa (2500 psi). After homogenization, the viscosity is 69,200 cps. The homogenized dispersion is then spray dried at an inlet temperature of 200°C and an average outlet temperature of 105°C, yielding 81.3 grams of a powder having a moisture content of 4.8%. Dispersions containing 2%, 3%, and 4%, all by weight of the powder, are prepared by mixing the appropriate amount of powder in water sufficient to prepare 400 grams of dispersion. Mixing is done in a Waring blender operated at a rheostat setting of 90 Volts for 3 minutes. The viscosity of each of these dispersions is measured by a Brookfield viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes. The measured viscosities are 3200 cps, 28,400 cps, and 44,000 cps, respectively. The percentage of colloidal material in the dispersion is determined to be 49.08%.

Example 5

Co-attrition of Hydrolyzed Cellulose Wetcake, Maltodextrin (DE 15), and Carboxymethylcellulose at a Ratio of 89/3/8

This example is similar to Example 4 except that the colloidal content of the final product is significantly reduced to 26.03%

In a Hobart mixer are combined 2386.1 grams of hydrolyzed cellulose wetcake, 32.54 grams of maltodextrin (DE 15) (92.2% solids) and 86.4 grams of carboxymethylcellulose (92.6% solids). The Hobart mixer is operated for 5 minutes after which the mixture is passed through a shear mixer having a somewhat restricted outlet gate. A portion of this sheared material is then dispersed in deionized water to prepare 3000 grams of dispersion containing 5 weight percent solids. The dispersion is prepared in a Waring blender operated at medium speed for 5 minutes. Mixing is interrupted after 2 minutes to scrape down the sides of the blender. The viscosity of this dispersion as measured by a Brookfield RVT viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes is 18,000 cps. The dispersion is then passed through a homogenizer operated at 17,236.9 kPa (2500 psi). After homogenization, the viscosity is 25,000 cps. The homogenized dispersion is then spray dried at an inlet temperature of 200°C and an average outlet temperature of 105°C, yielding 150 grams of a powder. The percentage of colloidal material in the powder is determined to be 26.03%.

Example 6

Co-attrition of Hydrolyzed Cellulose Wetcake, Maltodextrin (DE 15), and Carboxymethylcellulose at a Ratio of 65/27/8

The process described in this example differs from the process of Example 5 in that the maltodextrin is added after the combination of hydrolyzed cellulose wetcake and carboxymethylcellulose has been sheared, but before the combination is homogenized and spray dried. This modification yields a useful product which, when dispersed in water, provides significant viscosity.

In a Hobart mixer are combined 1742.63 grams of hydrolyzed cellulose wetcake and 86.40 grams of carboxymethylcellulose (92.6% solids). The Hobart mixer is operated for 5 minutes after which the mixture is passed through a shear mixer having a somewhat restricted outlet gate. A portion of this attrited material is then dispersed in deionized water to prepare 4000 grams of a dispersion containing 5 weight percent solids. The dispersion is prepared in a Waring blender operated at medium speed for 5 minutes. Mixing is interrupted after 2 minutes to add a 30% dispersion containing 292.84 grams of maltodextrin (DE 15) (92.2% solids). Sufficient water is withheld to prepare this dispersion when making the dispersion of the attrited wetcake and carboxymethylcellulose mixture. The blender is operated for 2 minutes after which mixing is again interrupted to scrape down the sides of the blender. Mixing is then completed. The viscosity of this dispersion as measured by a Brookfield RVT viscometer fitted with Spindle #4 operated at 1 rpm for 3 minutes is 28,000 cps. The dispersion is then passed through a homogenizer operated at 17,236.9 kPa (2500 psi). After homogenization, the viscosity is 36,000 cps. The homogenized dispersion is then spray dried at an inlet temperature of 200°C and an average outlet temperature of 105°C, yielding 130 grams of a powder. The percentage of colloidal material in the powder is determined to be 28.31%.

Example 7

Co-attrition of Hydrolyzed Cellulose Wetcake, Maltodextrin (DE 15), and Carboxymethylcellulose at a Ratio of 75/17/8

Preparation of several different ratios of hydrolyzed cellulose, maltodextrin (DE 15), and carboxymethylcellulose is described. Dispersions of each of these preparations are evaluated for their ability to provide a level of viscosity of the dispersion which is close to or above 1500 cps.

In a Hobart mixer are combined 1050.37 grams of hydrolyzed cellulose wetcake, 104.87 grams of maltodextrin (DE 15) (92.4% solids), 49.57 grams of carboxymethylcellulose (92.6% solids), and 295.2 grams of deionized water. The Hobart mixer is fitted with a paddle blade and is operated for 5 minutes after which the mixture is passed through a shear mixer operated at 150 rpm with a somewhat restricted outlet. A portion of this attrited material is then dispersed in deionized water to prepare a dispersion containing 5 weight percent solids. The dispersion is prepared in a Waring blender operated at medium speed for 5 minutes. This dispersion is then passed through a homogenizer operated at 17,236.9 kPa (2500 psi). The homogenized dispersion is then spray dried using a 91.4 cm (3 foot) Bowen spray dryer fitted with a spray nozzle operated at 620.53 kPa (90 psi) at an inlet temperature of 200°C and an outlet temperature of 100°C, yielding a powder. The dry powder is then passed through a #60 U.S. standard mesh before preparing a 2% by weight dispersion of the powder in deionized water. The initial viscosity of this dispersion as measured using a Brookfield RVT viscometer fitted with #2 spindle operated at 10 rpm for one minute is 1250 cps. After allowing the dispersion to remain undisturbed for 24 hours, the set-up viscosity is measured as being 1700 cps, operating the viscometer at the same conditions described above. The percentage of colloidal material in the powder is determined to be 32.4%.

Using the procedure described above, coprocessed powders are prepared comprising the following ratios of MCC/maltodextrin (DE 15)/CMC: 65/27/8, 80/12/8, 83/9/8, and 87/5/8. In preparing these materials, the amount of each component except the carboxymethylcellulose is adjusted to produce the desired ratio of components in the final product. Dispersions in which 2% by weight of each powder is dispersed in deionized water are prepared, and the initial viscosity and the set-up viscosity of each dispersion is measured by the procedure described above. Also, the colloidal content of the 65/27/8, 83/9/8, and the 87/5/8 powders is determined. The viscosities and colloidal content of these coprocessed powders are reported in Table 6.

Table 6

MCC/maltodextrin M-(DE 15)/CMC	Viscosity (cps) Initial	Set-up	Colloidal Content (%)
65/27/8	525	1340	38.0
75/17/8	1,250	1,700	32.4
80/12/8	1,640	1,880	-
83/9/8	1,340	1,420	27.1
87/5/8	765	1,300	23,2

Example 8

A Frozen Dessert Containing 4% Fat Stabilized with a Dry Blend of MCC/maltodextrin (50/50) and Carboxymethylcellulose

In a container stirred with a Lightnin' mixer are placed 2347 grams of skim milk and 666.8 grams of light cream. This mixture is mixed for about 5 minutes before adding a dry blend of 266.8 grams of non fat milk solids, 480 grams of sugar, 208.8 grams of 42 DE corn syrup solids, 16 grams of MCC/maltodextrin (50/50, 41% colloidal content) as prepared in Example 1, 0.4 gram of carrageenan (Viscarin® PS 171, FMC Corporation, Philadelphia, PA), and 4 grams of carboxymethylcellulose. This dry blend is added to the vortex of the mixer and mixed for 30 minutes to fully hydrate the gums. After increasing the temperature to 57°C (135°F), 10 grams of emulsifier (an 80:20 mixture of mono,diglycerides:Polysorbate 80) is added to the mixture which is stirred for an additional 2-3 minutes. Upon completion of mixing, the mixture is pasteurized by a high temperature short time process utilizing a Cherry-Burrel Ultra High Temperature unit operated for 25 seconds at 80°C (176°F). After pasteurization, the mixture is homogenized using an APV Gaulin Homogenizer, the first stage being operated at 2000 psi and the second stage at 500 psi. Upon completion of homogenization, the mixture is cooled and aged overnight in a refrigerator at 4°C (39.2°F). At the conclusion of the aging period, the mixture is frozen using a Taylor scraped surface ice cream freezer, packed in 236.6 mL (8 oz.) paper containers, and placed in a -28.9°C (-20°F) freezer to harden for at least 24 hours. Prior to being frozen the viscosity of the mixture is measured using a Brookfield LVF viscometer fitted with Spindle #2 operated at 60 rpm. The viscosity of this mixture is 175 cps. Evaluation by a sensory panel judges this frozen dessert to be 3.4 on a scale of 1-5

where 1 is icy and 5 is a warm sensation which is preferred. The panel also evaluates the body of the frozen dessert, giving it a rating of 3.8 on a scale of 1-5 where 1 is a lack of control of body and 5 is a heavy body (preferred). To measure the rate of melting of the frozen dessert, 236.6 mL (8 oz.) of it is placed on a 16 mesh wire gauze placed over a 100 mL graduated cylinder. As the dessert melts, it drips into the graduated cylinder and the total molten material is measured after one hour. During this period, 55 mL of the dessert melts.

For purposes of comparison, this exact formulation and procedure are used to prepare a frozen dessert stabilized with Avicel® RC-581 (FMC Corporation), 63% percent colloidal content. The viscosity of the mixture prior to being frozen is 180 cps. The sensory panel places both the iciness/warmth and the body of the frozen dessert at 3.0. During 60 minutes, 73 mL of this frozen dessert melts.

While this invention has been described in terms of certain preferred embodiments and illustrated by means of specific examples, the invention is not to be construed as limited except as set forth in the following claims.

Claims

1. A powdered coprocessed stabilizing agent comprising by weight, from about 40% to about 60% of a bulking agent, the balance comprising microcrystalline cellulose.

2. A powdered stabilizing agent according to claim 1 wherein the bulking agent is present in an amount of from about 45% to about 55%.

3. A powdered stabilizing agent according to claim 1 wherein the bulking agent is present in an amount of about 50%.

4. A powdered stabilizing agent according to claim 1 wherein the bulking agent is selected from polydextrose, mannitol, corn syrup solids, sorbitol, sucrose, dextrose, hydrolyzed cereal solids, fructose, lactose, maltose, invert sugars, maltodextrin, dextrins, galactose and mixtures thereof.

5. A powdered stabilizing agent according to claim 1 wherein the bulking agent is maltodextrin.

6. A powdered stabilizing agent according to claim 1 wherein the stabilizing agent is readily water dispersible.

7. A powdered stabilizing agent according to claim 1 wherein a flowing hydrocolloid powder is added in an amount of from about 1% to about 80% to the composition of claim 1.

8. A powdered stabilizing agent according to claim 7 wherein the flowing hydrocolloid powder is selected from guar gum, locust bean gum, gum arabic, sodium alginate, propylene glycol alginate, carrageenan, gum karaya, xanthan, konjac, agar, carboxymethyl cellulose, pectin, and mixtures thereof.

9. A powdered stabilizing agent according to claim 7 wherein the hydrocolloid powder comprises carboxymethyl cellulose.

10. A powdered stabilizing agent according to claim 7 wherein the flowing hydrocolloid powder is present in an amount of from about 4% to about 10%.

11. A powdered stabilizing agent comprising a coprocessed flowing powder of from about 3% to about 10% of carboxymethyl cellulose, about 5% to about 28% of maltodextrin, the balance being microcrystalline cellulose.

12. A powdered stabilizing agent according to claim 11 wherein the maltodextrin is present in a ratio of up to about 0.4 of maltodextrin to 1 of microcrystalline cellulose.

13. A powdered stabilizing agent according to claim 11 wherein the maltodextrin is present in an amount of from about 9% to about 17%.

14. A powdered stabilizing agent according to claim 11 wherein the carboxymethyl cellulose is present in an amount of from about 5% to about 10%.

15. A powdered stabilizing agent according to claim 11 wherein the microcrystalline cellulose is present in an amount of from about 62% to about 86%.

16. A food composition comprising a foodstuff having incorporated therein the stabilizing agent of any one of claims 1 through 15.

17. A food composition according to claim 16 wherein the stabilizing agent is present in the foodstuff in an amount of from about 0.1% to about 20%.

18. A food composition according to claim 16 wherein the foodstuff is a frozen dessert.

19. A food composition according to claim 16 wherein the foodstuff is a salad dressing.

20. A food composition according to claim 16 wherein the foodstuff is a yogurt.

21. A food composition according to claim 16 wherein the foodstuff is a beverage.

22. A food composition according to claim 16 wherein the foodstuff is selected from soups, gravies, sauces or bakery products.

23. A process for producing a powdered stabilizing agent comprising shearing a microcrystalline cellulose wetcake, blending the sheared wetcake with a bulking agent in an amount of from about 40% to about 60% of bulking agent and from about 60% to about 40% of microcrystalline cellulose, mixing the resultant blend containing up to about 30% solids, and drying the blended mixture to form a flowing powder.

24. A process according to claim 23 wherein the mixture is spray-dried to form a flowing powder.

25. A process according to claim 23 wherein maltodextrin is blended in an amount from about 45% to about 55%, with from about 55% to about 45% of microcrystalline cellulose.

26. A process according to claim 23 wherein the bulking agent is maltodextrin.

27. A process according to claim 23 wherein the bulking agent is blended, in an amount of about 50% with 50% of microcrystalline cellulose.

28. A process according to claim 23 wherein after the flowing powder has been prepared by coprocessing, a flowing hydrocolloid powder is added to the coprocessed flowing powder and blended therewith.

29. A process according to claim 28 comprising adding from about 1% to about 80% of the flowing hydrocolloid powder to the coprocessed flowing powder.

30. A process for increasing the viscosity of a liquid comprising adding to the liquid, from about 0.1% to about 20% of the stabilizing agent prepared according to any one of claims 28 through 29.

31. A process according to any one of claims 23 through 28 comprising adding the coprocessed flowing powder to a foodstuff or cosmetic in an amount of from about 0.1% to about 20% of the flowing powder and blending the foodstuff or cosmetic with the coprocessed powder.

32. A process for producing a powdered stabilizing agent comprising shearing a microcrystalline cellulose wetcake, blending the sheared wetcake with from about 5% to about 28% of maltodextrin and with from about 3% to about 10% of carboxymethyl cellulose, mixing the resultant blend and spray-drying the blended mixture to form a flowing powder.

INTERNATIONAL SEARCH REPORT

Int tional Application No
PCT/US 98/01329

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23L1/0534 A23L1/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 518 961 B (ASAHI) 29 October 1981 see page 2, line 1-13 see page 5, line 21-26 see example 1; tables 2,4,17 see claims ---	1-8,10, 16-32
A	WO 90 14017 A (FMC) 29 November 1990 see claims; examples 1,4 ---	1-32
A	WO 92 01390 A (FMC) 6 February 1992 see claims; examples 1-3 ---	1-32
A	US 4 980 193 A (D.C.TUASON ET AL.) 25 December 1990 cited in the application see claims --- -/--	1-32

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 342 636 A (A.S.BAKSHI ET AL.) 30 August 1994 see claims; example 4 -----	1-32

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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